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MONTHLY LETTER OF THE BUREAU OF ENTOMOLOGY
UNITED STATES DEPARTMENT OF AGRICULTURE

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★ JUN 28 1932
U. S. Department of Agriculture

Number 216

Activities for March
(Not for Publication)

April, 1932

FOREWORD

Hitherto this Monthly Letter has been devoted almost exclusively to items of interest or of progress selected from the monthly reports of field stations. A good many items of current interest come up in the general administrative functions of the Bureau in Washington and it is proposed that hereafter brief information with respect to the more important of such subjects be included in the opening page or pages of the Monthly Letter. These items will include not only administrative matters but important new appointments or assignments, as well as discussion of subjects of broader interest, and such items will be brought up to the date of the final preparation of the number.

GENERAL ITEMS

(To May 20)

Status of appropriation for the fiscal year 1933.—As this number of the Monthly Letter goes to press—May 20—the Act making appropriations to the Department for the fiscal year 1933 still awaits final action by Congress. The bill has been passed by both the House and the Senate and the conferees' report submitted. The conferees' report has not yet been considered by the Senate. The bill as approved by the conferees sustains the amendments made on the floor of the Senate, which reduce the amount carried in the House Bill for the Bureau by \$155,447. The three reductions are: Fruit and Shade-Tree Insects, \$47,645; Cotton Insects, \$72,872; and Taxonomy and Interrelations of Insects, \$34,930.

Grasshopper control left to States.—In furtherance of the program announced by Secretary Hyde last August, the Department submitted a recommendation for an appropriation of \$1,450,000 for cooperation in grasshopper control, and this item was duly approved and submitted by the President to Congress on February 4, 1932.

The plan of cooperation was substantially as worked out last winter in conference with State representatives and provided for a division of the cost between the Federal Government and the States concerned—the Federal moneys to go largely into the purchase and delivery of the poisoned bran bait and the States to assume the cost of local handling and distribution. The essential feature of the campaign was to make provision for poisoning the young grasshoppers as they emerge in

May from egg areas. This necessitated fairly prompt action as to the Federal appropriation to afford time for the execution of contracts for preparation and delivery of the bait and to permit the States to organize for its local handling.

At the time of the submittal of this item the Agricultural Bill had already passed the House and was before the Senate, and the item was incorporated as a Senate amendment to the bill March 8, 1932. The delay in the conference action on the bill led to the introduction of joint resolutions in both houses in an attempt to make the appropriation available earlier--the House resolution reducing the item to \$1,000,000. The final attempt (May 16) to secure joint action, namely, by the adoption by the House, under a suspension of the rules, of the Senate Joint Resolution--the amount being reduced to conform to the House action--failed by a decisive vote of 137 to 99. The practical effect of this is to close the door to any Federal aid in time for effective cooperation, and the Governors of the several States have been notified by the Secretary (May 18) of this situation and advised that the full burden of grasshopper control must now be undertaken as far as it can be by the States, counties, and persons in interest, but that the Department, through the Bureau of Entomology, will be glad to help so far as may be possible with its limited personnel concerned in grasshopper investigations.

Termite-control activities.--In the last two or three years there has been a large development in the field of commercial control of termites and this type of activity, in some quarters, has involved representations and methods which have led to demands from State officials and others for Federal consideration of the subject--consideration which resulted in the issuance of the circular of information of August 11, 1931. Repeated demands this present season for information of the character contained in this circular led to its reissuance April 15, 1932, in slightly revised form. The purpose of this note is to ask the field agents of the Bureau to report any features of the termite situation which may come to their knowledge. The Bureau has already received some interesting reports from field agents based on examinations made in response to local requests.

Curtis P. Clausen given new assignment.--Effective May 16, Mr. Clausen was transferred from the field to the departmental service. In the new assignment Mr. Clausen will be responsible to the Chief of the Bureau for coordinating work of the several divisions and cooperating States concerned with the importation of beneficial insects and with investigations and work concerned with the breeding up for local control purposes or for interstate distribution of native and long established beneficial insects. He will also aid the Chief in cooperating with the Plant Quarantine and Control Administration in the enforcement of the Insect Pest Act of 1905, particularly as it involves the interstate shipment of beneficial insects. Mr. Clausen's wide experience with parasites, especially his familiarity with the work in foreign countries, makes him well qualified to fill this new position. In connection with this assignment it is expected that Mr. Clausen will visit various field stations of the Bureau in order to become more familiar with the work that is being carried on.

CEREAL AND FORAGE INSECTS

Miss Esther H. Hart, Artist for this division, who retired on February 29, wishes to extend to her friends and associates in Washington and her friends in the field her deep appreciation of the gift presented to her on that occasion.

Aged leafhopper survives low temperatures.--F. W. Poos, of the Arlington Experiment Farm, Rosslyn, Va., reports: "One female Empoasca abrupta De L. has survived all of the low temperatures (down to 10° F.) in a life-history cage in the insectary. This individual was 176 days of age on April 1."

British Museum exchanges billbugs.--From A. F. Satterthwait we have the following note: "A collection of 11 species of Calendra, 10 new to the (reference) collection of the Webster Groves, Mo., laboratory, was sent by the British Museum in exchange for several species supplied from duplicate material at the Webster Groves laboratory."

Prodenia ornithogalli Guen. flies unusually early.--J. R. Horton, Wichita, Kans., states that "On March 29" he "found one adult of the yellow-striped armyworm on the wing. This is the earliest record we have of the occurrence of this moth in the spring. Observations during several years have shown that its flights generally occur in the latter part of May. In 1931, the first moths were taken April 19, the earliest record up to that time * * * Both the present flight and that of last year were probably due to the exceptionally mild winters preceding."

Pogonomyrmex barbatus F. Smith breeds under laboratory conditions.--V. L. Wildermuth, Tempe, Ariz., reports that "A large molding plaster cage was constructed by E. G. Davis, and a colony of red harvester ants with an active queen was established therein. Galleries and storage chambers were fashioned after those found in a normal ant colony, and the face of the cage is covered with a sheet of glass, protected by a removable opaque slide for observing the seasonal and life-history activities of the colony. Moisture chambers are provided in two of the food chambers; and while it is realized that there may be some trouble in temperature control, simulating the temperature found in an ant colony, it is hoped that much additional information may be secured from this cage. The queen had already deposited one cluster of eggs by the end of the month (March)."

Mortality of corn borer increased by freeze.--Reporting from the European corn borer laboratory at Toledo, Ohio, Morris Schlosberg says: "A survey made March 31 revealed a mortality of corn borer larvae of approximately 9 per cent in the Toledo District, an increase from approximately 2 per cent recorded in previous surveys. This may be ascribable to the unseasonably cold weather conditions that prevailed during March. An abnormally mild and open winter may account for the markedly low rate of mortality obtaining previous to this time. The (surviving) borers appear in excellent condition in the field."

Winter importations of corn borer parasites.--S. M. Dohanian, Arlington, Mass., reports that importations to March 31, 1932, from France, Italy, and the Orient total 3,803,125 borers, with 38,256 *Eulimneria* and 23,749 *Microgaster*, also from Italy 399,850 *Eulophus*.

Parasite situation in Michigan.--Ralph F. Mathes, engaged in the recovery of corn borer parasites at Monroe, Mich., reports: "Borers collected and stored prior to March 14 under hibernation conditions in the laboratory to supply information on the field status of imported and native parasites were placed under incubation conditions on that date. * * * *Inareolata punctoria* Roman is appearing in quantity from practically every locality where liberated the past season; *Chelonus annulipes* Wesm. continues to appear in the Jerusalem, Ohio, locality; *Microgaster tibialis* Nees is being recovered from most of the points where liberated last summer; *Masicera senilis* Rond. continues to be the most promising parasite in the area. It is being recovered in quantity from nearly every locality where liberated."

Fungus disease prevalent in stored corn borers.--W. A. Baker, Monroe, reports that "The fungus disease *Beauveria bassiana* (Bals.) Vuill. produced an abnormally high mortality among the stored European corn borers this season. Its appearance was noticed in the laboratory under conditions of storage and forcing, and was quite general throughout the collections. A particularly severe infection occurred in the collection of borers originating in northeastern Ohio."

Larval survival of European corn borer declines in weeds in New England.--"The usual tests of survival on important weed host plants by means of artificially induced infestation were conducted in 1931," according to B. E. Hodgson, S. O. Hill, and H. J. Cronin, Arlington, Mass. "In this work eggs are obtained on the underside of the leaves by the use of small cages." A tabulation of results shows the total survival on ragweed to be 6.7 per cent, as compared with 12.0 per cent in 1930, and on pigweed 3.5 per cent, as compared with 5.0 per cent in 1930. "With the exception of mugwort (75.6 per cent) the percentages of survival run low as compared with corn," which averaged 28.25 per cent in 1930.

Bait-trapping for corn borer.--"Bait-trap experiments conducted during the 1931 August flight period at the U. S. D. A. Farm in Berkeley, Mass.," are reported by C. H. Batchelder and D. D. Questel. " * * * traps were located at the margins of sweet-corn fields for the purpose of determining the comparative effectiveness of several fermenting sirups, the catch was read from three to five times during each night, and records were kept relative to the time, location, preparation, and sex of the moths caught. A summary of these catches for the period" shows that of an average number of 54 traps employed per night for 28 nights on 5 acres of "Golden Sunshine" sweet corn, with an average of 10.8 traps per acre, a total of 2,667 moths were caught, or an average of 49 moths per trap and 533 moths per acre. "Such a

catch of moths per acre for the season may be indicative of further usefulness when more effective preparations and improved traps are employed."

Strain of corn apparently tolerant to borer.--L. H. Patch, Sandusky, Ohio, reports that "one strain of corn, of the 24 strains tested in 1931, seemed particularly promising from the standpoint of the yield, the low borer survival upon it, the low rate of dropping off in yield of grain with increasing mean borer populations, the breakage of the stalks in the presence of the corn borer, and freedom from smutted plants. This hybrid, obtained by crossing two inbred strains, Hy and R4, gave the maximum yield of 104.8 bushels of grain per acre, compared to the mean of 79.3 bushels. The borer survival on it was 9.0 per cent, compared to the mean of 16.5 per cent and the minimum of 8.8 per cent. The rate of decrease of its yield with increasing mean borer populations was the minimum for the 24 strains, being 1.51 bushels per acre per borer per plant, compared to the mean of 2.08 bushels."

Kansas fly-resistant wheat susceptible in Indiana.--W. B. Noble, West Lafayette, Ind., reports that "The third of a triplicate series of tests of R. H. Painter's Kansas resistant varieties of wheat were completed. * * * None of these varieties showed resistance to Indiana flies, although some continued to show more tendency to recover by tillering than others."

Host plants of *Illinoia pisi* Kalt. in Oregon.--L. P. Rockwood, Forest Grove, Oreg., reports that "Observations of aphids on plots of vetch and oats and Austrian field peas (seeded alone), that were seeded on September 21, October 3, October 15, and November 21, 1931, were made on March 8 and on April 1, 1932. * * * These observations and those of last fall indicate that *Illinoia pisi* established itself last fall on vetch and peas that were seeded as late as October 15, although earlier sown plots showed a much higher infestation in November and April."

COTTON INSECTS

Effect of storage conditions on pink bollworm.--S. L. Calhoun and L. C. Fife, Presidio, Tex., report an experiment inaugurated October 17, 1931, "to determine the best method of winter storage of larvae of *Pectinophora gossypiella* Saund. collected from gin trash and to determine whether the place of storage or the type of hibernating medium, or both, had any effect upon survival." The experiment was completed on March 15. Results show that "(1) The place of storage had very little effect upon the survival of larvae collected from gin trash; (2) an increased survival of 2.39 per cent was recorded for larvae hibernating in corrugated pasteboard strips over those hibernating in gin trash; (3) a survival of 80.19 per cent was recorded for those larvae hibernating under normal conditions and which were obtained from the biological experiments; (4) the high mortality occurring in larvae collected from the gin trash

by means of the gin trash machine and which was recorded under all conditions studied was caused by injury from the collecting machine."

Life history of pink bollworm in squares and bolls.--Messrs. Calhoun and Fife describe an experiment started in May, 1931, and completed in November, 1931, "to determine the number and time of appearance of the different generations of the pink bollworm and, in addition, the comparative duration, in both squares and bolls, of the different stages of the life cycle for each generation." A tabulation of results shows that "(1) At Presidio, Tex., in 1931, there were six generations of the pink bollworm in squares but only three and a partial fourth in bolls; (2) the duration of the developmental period in bolls was 6.4 days longer than in squares and the larger portion of this difference occurred during the larval period; (3) males required a slightly longer period for development than females. The longer period necessary for development of the pupae of the males accounted for the greater part of this difference; (4) temperature does not entirely govern the rate of development; (5) in the field there is a continuous overlapping of generations after the first generation in squares, owing to delayed emergence of long-cycle moths, to differences in the rate of development in squares and bolls, and to other factors."

Emergence of cotton flea hopper.--K. P. Ewing and R. L. McGarr, Tallulah, report that "The first live specimen of Psallus seriatus Reut. for this season was found on March 1, in an emergence cage. To date (April 1) no live nymphs have been found in the field."

Tarnished plant bug gets early start.--Messrs. Ewing and McGarr also report that "Adults of Lygus pratensis L. have been observed to be active on various plants, especially alfalfa, throughout the winter. The first nymphs of the season were observed on March 16. However, some of the nymphs found on this date were third and fourth instars, indicating that they were hatched at least 10 days previously. This shows that overwintered females of Lygus pratensis started laying eggs during the latter part of February." In "1,500 sweeps with a hand net made from February 29 to March 26 on alfalfa and oats * * * L. pratensis was the only mirid collected." The numbers taken on alfalfa for weekly intervals (excluding March 7 to 12) were 39.8, 33.7, and 16.8; on oats the number for each corresponding period was 1.0.

Boll weevil movements.--Collections of boll weevils from the 26 screen traps located in eight cotton fields and two pastures in Madison Parish, La., are reported by G. L. Smith, J. C. Clark, and A. L. Scales, as follows: "In January 207 weevils were collected, in February 175, and 223 in March. * * * The peaks of weevil movements always occurred following two or three days with maximum temperatures around 80° F. and sunshine. * * * The movement of weevils was very light from March 5 to 18, at which time the lowest temperatures for the winter occurred. However, 11 weevils were collected during this period when the minimum temperature was never higher than 35° F. An interesting feature in the

study of weevils collected on the field screens and the woods screens (located in pasture land between cotton fields and timber) for the three winter months, January, February, and March, is the difference in the average number of weevils for these screens. During the three months 580 weevils were collected on the 24 field screens, or an average of 24.1 weevils per screen. On the two woods screens 25 weevils were collected, or 12.5 weevils per screen. Apparently the weevil movement was much greater within the fields than between cotton fields and timber."

Cotton leaf perforator active all winter.---Notes by T. C. Barber, Brownsville, Tex., on the life history of Bucculatrix thurberiella Busck show that "the development of the species continued through March, in the same manner that it had been doing during the remainder of the winter months. Since cotton planting was well in progress during March, and considerable cotton had already sprouted, it has thus been proved that active development occurred right through the winter of 1931-32 in the Lower Rio Grande Valley of Texas."

INSECTS AFFECTING MAN AND ANIMALS

Community trapping of eye gnats effective.---D. C. Parman, reporting on control of Hippelates spp. at Coachella, Calif., says:"Community trapping was first started with approximately 75 of the small box jar traps at the Coachella Valley High School in the early spring of 1930 * * * This test was continued through the summer and a high percentage of control was indicated. In the fall of 1930 the large box trap with a windmill bait agitator was developed and installed at the laboratory and another larger trap of the same type was installed at Indio. In March, 1931, the Coachella Valley Abatement District had 18 of the large traps constructed and these were installed at the six schools in the valley in March or the first of April. Those traps apparently gave a high percentage of control of eye infections in the schools last year. The traps were installed and serviced by the Bureau of Entomology until July 1, 1931, when the servicing was taken over by the Abatement District and has been continued, and 21 more traps will be installed at an early date. * * * using the status of March (the month indicated by the status as having the high peak of abundance of gnats), 1930, as a basis, there was a control of 67 per cent in 1931, and 96 per cent for 1932. * * * While some trapping has been done by individuals it is indicated that the greatest decreases have been in the vicinities of the systematically serviced traps of the Abatement District."

Creosoted pine sap kills house fly larvae.---W. E. Dove reports that "During the mild winter just past, house flies continued to breed at the city dumping ground. On the first of February they were very annoying in buildings at Charleston (S. C.). At the city dump millions of flies were present. The indiscriminate practice of dumping garbage mixed with paper along the edges of the dump resulted in the presence of heavy infestations of larvae." Mr. Dove and his assistants used a power spray-

er in treating the dump." * * * 8,500 gallons of creosoted pine sap was sprayed where fly larvae were found. From laboratory tests we estimated that it would require 12 hours to kill the treated larvae. We attempted to saturate the paper and garbage. * * * within 30 minutes most of the larvae were killed * * * The active larvae came into constant contact with this new insecticide. Of 24 one-quart samples of larvae and media taken from the dump after treatment, three samples produced viable pupae. In others a few undeveloped living larvae could be found. The viable pupae were found in wet paper and under pieces of broken glass. The creosoted pine sap did not penetrate the paper, which previously had been saturated with water. Also, it did not get under the broken pieces of glass. * * * The tests convince us that creosoted pine sap is effective in killing house fly larvae. The tests emphasize the need of keeping garbage separated from waste paper, so that it can be treated effectively."

Goat lice yield to derris extract.---"On March 26, 1932, 15 head of goats were dipped in derris extract (rotenone) at a strength of 1 to 600," reports O. G. Babcock, Sonora, Tex. "The dipping was done immediately after shearing. The animals were dipped once only and turned out in pastures. On the fifth day following shearing all animals were rounded up and carefully examined. Not a single live louse could be found, thus apparently a 100 per cent kill. More time is required for definite information as to hatching of eggs. Several of the above animals were heavily infested with Bovicola caprae Gult. and B. lirbatus Gerv."

Gastrophilus species in Illinois.---Reporting on the numbers and positions of Gastrophilus larvae taken from the stomachs of horses slaughtered at Galesburg, Ill., on October 15, 1931, R. W. Wells says: "It appears that in this region Gastrophilus nasalis L. greatly outnumber, in the host, the other two species. G. intestinalis De G. eggs seem abundant and are very conspicuous, but it appears that G. nasalis is the more successful in gaining entrance to the host. As G. nasalis confines itself so exclusively to the duodenum, it seems possible that it may not be so vulnerable to prevailing larvicides as are G. intestinalis and G. haemorrhoidalis L., which confine their attachments almost entirely to the stomach."

STORED PRODUCT INSECTS

Subzero temperature kills Bruchus pisorum L.---Tom Brindley, who has been making a study of the effect of freezing on the survival of the pea weevil at the Moscow, Idaho, sublaboratory, says: "Adults exposed without protection to a temperature of -16.6° F. were killed in less than 15 minutes. Adult weevils still in the peas were all dead at the end of 45 minutes."

Staphylinus nigrellus Forn eats pea weevil.---A. O. Larson, Corvallis, Oreg., reporting on an examination of a row of about 350 fence

posts for hibernating pea weevils, says: "A staphylinid beetle was found in one post, accompanied by some pieces of dead pea weevils. It was taken to the laboratory, confined in a test tube, and given pea weevils to eat. It ate 29 weevils in 8 days. * * * As this beetle is frequently found in the hibernating quarters of the pea weevil it is highly probable that it accounts for the destruction of many weevils."

Ephestia figuliella Greg. thrives in celluloid vials.--H. C. Tonohoe, Fresno, Calif., "has obtained," according to Perez Simmons, "significant results in the first few comparative tests of glass and of celluloid life-history vials. Three female raisin moths in glass vials averaged 133 eggs each, while three females kept in celluloid vials laid an average of 221 eggs. The percentage of eggs which hatched in celluloid vials was 60.1, as compared with 41.6 in glass vials, and the average incubation period was 4 days in celluloid vials and 4.2 in glass vials. The average temperature of the parallel tests was 80° F."

TOXICOLOGY AND PHYSIOLOGY OF INSECTS

Tests of derivatives of rotenone.--Following tests made by C. E. F. Gersdorff and J. Davidson, of the Bureau of Chemistry and Soils, of "sunburned" rotenone against goldfish, the greenhouse whitefly, and aphids, in which the toxicity of this form of rotenone was found to be markedly reduced, F. L. Campbell and W. L. Sullivan redoubled their efforts "to find a light-stable, highly toxic derivative of rotenone." Mr. Campbell says, "during the month (March) we tested and retested 10 compounds, in addition to rotenone. * * * All solutions were made at a concentration of 1-to-5,000 in absolute alcohol. The solution to be sprayed was placed in a 25 cm³ graduated cylinder which was filled to the 25 cm³ mark. The solution was sprayed out till the meniscus fell to the 5 cm³ mark. * * * In each test 50 flies in a large screen-covered Petri dish were sprayed directly and were then exposed for 3 minutes to the settling fog of the spray. * * * Counts of dead and moribund flies were made at the end of 46 hours, instead of 48 hours, so that the cages could be used again on the day on which they were released. * * * the following average results were obtained in terms of per cent effect: Rotenone 86.4 per cent (10 tests); dihydrorotenone 65.5 per cent (10 tests); rotenone hydrochloride 30.0 per cent (10 tests); acetyl rotenone 25.0 per cent (7 tests). * * * We have great confidence in the accuracy of our results on rotenone, dihydrorotenone, rotenone hydrochloride, and acetyl rotenone and, hence, in the order of value we have assigned to them, * * * we feel sure that rotenone is more toxic than any of its derivatives that have yet been tested, and that dihydrorotenone is the most toxic of these derivatives, being almost as good as rotenone. * * * With the assurance that dihydrorotenone is the most promising derivative of rotenone, the Insecticide Division proceeded to study the effect of light on dihydrorotenone in comparison with its effect on rotenone. * * * Goldfish tests indicated that the rotenone powder was only about half as toxic as it was before exposure (to the light of a powerful carbon

arc lamp for 62 hours), whereas the toxicity of dihydrorotenone was not affected. Dihydrorotenone therefore appears to be the toxic, light-stable compound for which we have been searching."

BEE CULTURE

New honey sample received.---Jas. I. Hambleton, Somerset, Md., reports that he received in March "a sample of honey from Amelanchier alnifolia, produced at 6,000 feet elevation in the Eldorado National Forest, Strawberry, Calif. This interesting sample was sent for our permanent collection."

Economic survey completed.---The field work on this project, begun on January 24 by Frank E. Todd of the Davis, Calif., laboratory, working with A. S. Burrier, of the Farm Management Department of the Oregon Experiment Station, was concluded on March 10. The period covered in the study was for the beekeeping year of 1931, * * * Excellent cooperation was received, both from the experiment station and from beekeepers. Production and management records were secured from 89 beekeepers in the chief honey producing regions of the State. A few more records remain to be taken by Mr. Burrier, to complete the work of the year. A total of 39 working days was spent on the project with an average of 2.3 records per day and travel of about 65½ miles per record. Beekeeping is widely scattered in Oregon and the average number of colonies per apiarist visited was 198. A decline of approximately 27 per cent in the number of colonies since 1920 was shown. Many former beekeepers are now out of business, the most common reason given being the prevalence of bee disease. * * * Among losses encountered, spray poison was important. Winter and spring losses are important in some sections. The marketing problem seems not to be important. Almost no honey buyers are active in the State, the production being about 2 pounds per capita of population, sold and consumed mostly locally. * * * A list of active Oregon beekeepers has been prepared and sent to the Market News Service. * * * As yet fruit growers have not taken special interest in pollination. The market for bees for pollination is growing, some interest being taken in use of package bees because of loss of colonies from spray poison, prevalence of disease, and fear of spread of pear blight. This has been one of the poorest honey years ever experienced in Oregon beekeeping, the crop average being about 61½ pounds. The results of this survey must, therefore, be considered as representing a minimum year."

Bees like emasculated blossoms.---"An interesting observation of bees working emasculated apricot blossoms for nectar" by George H. Vansell, Davis, Calif., is reported by E. L. Sechrist, as follows: "Fruit investigators had supposed that bees would not visit blossoms from which the petals and blossom base had been removed. Vansell found, however, that not only did bees visit these blossoms but that once a bee had begun to work the emasculated blossoms, it usually continued

to visit such blossoms, almost to the exclusion of normal blossoms. On examination, he found that the nectaries on apricot blossoms were so deep down in the cup surrounding the pistil that they were not removed when the blossoms were emasculated, and that the removal of the upper part of the blossom apparently made the nectaries of such easy access that bees preferred to visit the emasculated blossoms. This was not true of such blossoms as the almond, in which the nectaries, being high up in the cup, are removed with the petals. This discovery upset some of the plans of the University workers on pollination and made necessary the bagging instead of emasculation of certain blossoms which they desired to hand pollinate. Emasculated nectarine and peach blossoms were also worked by bees for nectar."

Pan American Union requests bee manuscript.--In March a manuscript by Jas. I. Hambleton, entitled, "Beekeeping in the United States," was submitted to the Editorial Office for approval. This manuscript was prepared upon the request of the Director General of the Pan American Union for publication in its Spanish Bulletin.

FRUIT AND SHADE TREE INSECTS

Cockroaches react to poison pills.--E. H. Siegler and Francis Munger, Takoma Park, Md., have devised a method of testing stomach poisons, using Periplaneta americana L. as a test insect and feeding the poison in pills of gelatine. By this method known quantities of the poison to be tested are incorporated in a layer of gelatine one-eighth inch thick. By means of a cork borer, pills of a definite volume are cut out from the gelatine so that the quantity of poison consumed may be estimated with a fair degree of accuracy, placing the tests on a semi-quantitative basis. The results of tests conducted during the month of March indicate that sodium fluoride is not so toxic as a stomach poison to the cockroach as is lead arsenate. For example, during the above period the roaches feeding on sodium fluoride consumed slightly more than three times the quantity consumed by the roaches feeding on lead arsenate. The lead arsenate killed 75 per cent of the roaches, whereas the mortality with sodium fluoride was zero. However, sodium fluoride is effective as a stomach poison when consumed in larger quantities. Rotenone, although used in a very high concentration for this compound and consumed in larger quantity than the arsenical and fluoride, gave no mortality.

Proof that sodium fluoride kills roaches by contact.--Mr. Munger has devised an effective method of determining the contact effect of certain materials against the cockroach, as distinguished from the action of the same materials as stomach poisons. This method consists of isolating the head from the remainder of the insect by the use of a thin rubber dental dam. In tests with sodium fluoride, death followed within a few hours when the cockroaches were placed in vials containing small quantities of the powder. The head was left in such a position that none of the material could have been taken internally. Insects similarly collared in clean vials did not die.

Camphor scale controlled by oil sprays.—"The analysis of the results of the laboratory and field sprays applied in January against Pseudonidia duplex Ckll. by L. H. Dawsey, J. O. Dumestre, L. T. Kessels, and A. W. Cressman have been completed and are submitted by them." They report that "the scales in the laboratory sprays were in the pink and early-gravid stage, while the scales in the field were more advanced, most of them being reproducing. * * * From these two series of tests in conjunction with the sprays applied last summer we may conclude: (1) The relation between efficiency of a spray and oil deposited on the plant surface was a curvilinear one, the increase in mortality being more rapid with smaller amounts of oil, but the effectiveness was still increasing when 21×10^{-5} gm. oil/cm² of oil were retained by the plant surface; (2) the severity of infestation is an important factor in control of the camphor scale. More oil was required to kill the scale as the population density increased; (3) the scales showed decreasing susceptibility to oils as they became older. This applied not only to different instars, but throughout the adult stage; (4) 21×10^{-5} gm. oil/cm² of a highly refined oil did not injure camphor trees when applied as a winter spray; (5) the amount of oil deposited on a sprayed plant can be increased by decreasing the emulsifier concentration or by increasing the oil concentration."

Resistance of California red scale to HCN.—Laboratory experiments in the control of Chrysomphalus aurantii Mask. with HCN under controlled conditions are reported by C. I. Bliss and assistants, Whittier, Calif. Mr. Bliss says that to determine the "effect of the type of food upon the survival of red scale on lemon trees in the College grove at Whittier, a series of twigs bearing leaves were exposed at 77° F. for 25 minutes to varying concentrations of HCN. * * * On the three types of food, the scales on fruits were more resistant than those on twigs, those on twigs were more resistant than those on the upper surface of the leaves. So few scales collected on the lower surface of the leaves that no counts of this type were made. The results from fruits were determined about 3 months prior to those on twigs and leaves, but a later analysis on fruits taken in a slightly different manner shows that the seasonal change did not modify the relative survival on the different types of host material."

Time-temperature effects on larvae of Ceratitis capitata Wied.—O. C. McBride and Tai Hee Hong, Honolulu, T. H., report that "In all tests to date we find the margin of safety in the heat treatment (that is, 8 hours heating at 110° F.) is sufficient for all fruits studied. * * * One series of tests on the Indian almond (kamani nut) containing 7,602 larvae has just been completed. * * * At an average temperature of 109.87° F. complete mortality of larvae and eggs in the kamani nuts is between $4\frac{1}{2}$ and $5\frac{1}{2}$ hours. Our earlier experiments carried out in the Carrier machine required about 25 per cent longer to give complete mortality. The data show further that the percentage of larvae emerging from the fruits decreases as the time of treatment increases. Like-

wise, the percentage of larvae pupating decreases as the exposure increases, and the percentage of pupae emerging as adults decreases as the time of exposure increases. Thus, many of the larvae subjected to the heat treatment are able to emerge from the fruits and pupate, but are weakened by the heat to such a degree that the pupae die before the adults emerge. In another experiment employing naturally infested sour oranges consisting of 770 larvae, complete mortality was obtained between $4\frac{1}{2}$ and $5\frac{1}{2}$ hours when heated at 109.87° F. From data obtained to date, the temperature and time of exposure employed in Florida are sufficient to give complete control in Hawaiian naturally infested fruits."

Experiments with low temperatures are described as follows: "Seven lots of sour oranges held at an average temperature of 28° F. gave complete mortality after an exposure of 120 hours. A total of 882 larvae were employed in these tests. A number of the larvae emerging at the end of 48, 72, and 96 hours did not produce normal pupae. Several of the larvae retained their normal shape but a chitinous covering formed about the larvae that had the appearance and texture of pupa case. In no case were the deformed pupae able to produce normal adults. In kamani nuts, one larva emerged and pupated in the lot exposed for 144 hours at 26° F. The pupa died before the adult emerged. This series of tests included 6,335 larvae. * * * The data obtained to date show that the minimum exposure of infested fruits to a temperature of 28° F. is 144 hours (6 days)."

Penetration of soil by adults of the dark fruit fly.—James Zelek, Panama Canal Zone, reports that "fifty larvae of Anastrepha serpentina Wied. were placed on top of a tube of soil 3 inches in diameter and 26 inches high. After 4 days the tube was inverted. Only one adult found its way out 16 days after pupation. When the tube of earth was carefully examined, it was found that the larvae pupated about 3 inches from the surface, so that the adults had to travel through about 23 inches of earth. We found 45 dead adults half way up, that is, 13 inches from the top. Three puparia were dead and in one instance the adult died before getting entirely out of the puparium. It is evident that 23 inches of soil is too much for the adults. We have many records of exact depth to which larvae descend to pupate. Usually it is within a few inches of the top."

Gains in Trichogramma host production.—Herbert Spencer and Luther Brown, engaged in investigations of parasites of pecan insects at Albany, Ga., report that "During March, 321,100 Angoumois grain moths were collected in one of the incubator rooms, and from these moths 4,512,000 eggs were obtained. Three million eight hundred and fifty thousand were placed in a second incubator room filled with trays of corn to start infestation, and increase of the Trichogramma consumed the remainder. This March production of moths and eggs is far ahead of that of March, 1931, when only 30,800 moths were collected, and only 154,000 eggs were obtained. * * * No mites of any species are present in the incubator rooms, an

unusually favorable condition which has never been attained before, since Seius (Seiulus) pomi Parrott has been a more or less troublesome pest in the work previously. We attribute this freedom from mites to several thorough fumigations with sulphur dioxide, and to care in selecting mite-free eggs for infesting the incubator rooms."

JAPANESE BEETLE AND ASIATIC BEETLE RESEARCH

Beetle larvae remain dormant through March.--Larvae of the Japanese beetle (Ponillia japonica Newm.) "remained in dormant state throughout practically the entire month," according to Henry Fox, Moorestown, N. J., who says, "The temperature in general was low and only near the end of the month did the soil near the surface become sufficiently warm to favor renewal of larval activity. Rainfall was rather excessive. * * * As previously noted, indications of an upward movement were found in January, but since then a steady decline in the percentage of larvae occurring within 1 inch of the surface has been evidenced in the field records, with the result that, in March, only a very few were found within this distance of the surface."

Lateral migration of grubs in soil.--I. M. Hawley, Moorestown, reports: "Two tests with grubs brought in from the field have been carried on under conditions that would permit a migration up to 7 feet. Two bins, each 8 by 4 feet, filled with about 1 foot of moist compact soil were set up in the greenhouse. In each bin 100 grubs were placed at a depth of 3 to 5 inches in a trench 1 foot from one end. In the last foot in the other end of each bin wheat was planted. It was necessary, therefore, for grubs to travel at least 6 feet to reach the wheat, and by going through the wheat they could travel a distance of 7 feet. The first bin, started on January 30, was examined on March 7, and the second bin, started on February 20, was examined on March 28, the time covered in each case being 37 days. Of 161 grubs recovered in the 2 bins, 7 traveled more than 80 inches, 13 more than 70 inches, 20 more than 60 inches, 32 more than 50 inches, 50 more than 40 inches, 65 more than 30 inches, and 78 more than 20 inches. The others were found nearer the starting line or had moved toward the opposite end of the bin only 1 foot away. It is interesting to note that 6 grubs traveled through 6 feet of fallow soil and 1 foot of wheat and reached the end of the bin. In the first test 43 of 75 recovered were in the top 6 inches of soil, while 71 of 86 recovered in the second test were above the 6-inch level." (See also February Letter, page 9).

Japanese beetle larvae survive flooding.--W. E. Fleming and F. E. Baker, Moorestown, report that "one hundred more larvae have been removed from Budd's cranberry bog near Pemberton, N. J., where they had been submerged for 90 days. They were returned to the laboratory and held for observation. The result of the final observation of these larvae was as follows: Those submerged 90 days were found to be 48.0 per cent normal."

New quarters for Yokohama laboratory.---"On February 1," reports L. B. Parker, "the Yokohama laboratory was transferred from 223-bluff, Nakamura to No. 21 Yamashita-cho. This transfer, which provides several advantages, was made in order to get quarters with sufficient space to accomodate the office and laboratory needs of both the oriental fruit moth work, with G. J. Haeussler in charge, and the Japanese and Asiatic beetle work, with L. B. Parker in charge. * * * The new laboratory is situated at No. 21 Yamashita-cho, in a portion of the building owned and occupied by the Canadian Pacific S. S. Co. It comprises approximately 1,050 square feet of floor space, with electricity and water, and, located as it is, it is convenient to the business section, post office, shipping offices, and docks."

TRUCK CROP AND GARDEN INSECTS

Protracted vacuum necessary for control of gladiolus thrips with HCN.---H. H. Richardson, of the tropical greenhouse, Washington, D. C., reporting on methods of vacuum fumigation of infested gladiolus corms for control of Taeniothrips gladioli M. & S., says: "With a dosage of 180 cm³ of liquid hydrocyanic acid per 1,000 cu. ft. of space (vacuum of 27 inches, temperature 73 to 75° F.), complete kill of all stages of the thrips, including the eggs, was obtained only when the vacuum was held for a period of at least one hour."

Requirements for hatching of Taeniothrips eggs.---Floyd F. Smith reports that "eggs of Taeniothrips gladioli do not hatch at a temperature below 50° F. or at 90° F. with 70 per cent humidity under greenhouse conditions. At 90° F. in a saturated atmosphere, only 3 larvae hatched from 200 eggs. Eggs in cormels chilled for 3 days before being placed at room temperature hatched, but those chilled for 11 days or longer did not hatch. It is apparent that suberization of the corm tissue at the extreme temperatures may interfere with the hatching of the eggs. These data on the cool temperature are of practical value in the winter storage of gladiolus corms."

Strawberry weevil injury reduced by forest fires.---"Observations," by W. A. Thomas, Chadbourn, N. C., "during the past few weeks have shown that where the winter forest fires destroyed the hibernation quarters (of Anthonomus signatus Say) adjacent to strawberry fields, little or no injury is now apparent. In such areas, the amount of injury is in proportion to the thoroughness of the destruction of trashy areas about the fields. In some instances only a small clump of grass or gallberry plants was left unburned and almost invariably the adjacent plants are the only ones to show any infestation at present. This is attributed to the few hibernating weevils left in the unburned areas."

Sciaridae not fresh-air fiends.---A. C. Davis, of the mushroom-insects project, Takoma Park, Md., reports that "a few experiments were made to ascertain whether or not a circulation of air was necessary to adult flies. Air of various humidities was passed through the bottles

in which adult flies were confined. On the whole, the flies lived longer in tightly corked vials than in those through which air was circulated. This series of experiments is still being carried on, with both larvae and adult flies." Mr. Davis also states that "counts (of these flies) have been made at Arlington Farm, Va., by spreading sheets of tanglefoot paper on the beds. So far these have shown the proportion of sexes to be 56.40 per cent males and 43.50 per cent females."

Mortality of Mexican bean beetle.--Neale F. Howard and H. C. Mason, Columbus, Ohio, report that "samples were taken three times during the month (March) from one of the hibernation cages to determine the percentage of survival of the Mexican bean beetle (Epilachna corrupta Muls.)" Results (tabulated) show that the percentage of live beetles ranged from 12.31 to 22.72. The maximum air temperature in the cages was 67.5° F. and the minimum 0° F. "From these data it would appear that the severe cold weather of early March did not cause any unusual mortality in hibernating adults of the Mexican bean beetle, although the data on hand are hardly sufficient to draw a definite conclusion."

Precipitation stimulates emergence of beetles.--J. R. Douglass, Estancia, N. Mex., has completed his study on precipitation as a factor in the emergence of Epilachna corrupta Muls. from hibernation. He summarizes this work as follows: " * * * precipitation is the greater of the two known factors in stimulating emergence of the Mexican bean beetle from hibernation; * * * permanent emergence rarely occurs when the daily temperature is below 50° F.; * * * rainfall is the starter and temperature is the accelerator in stimulating beetles to emerge; * * * the temperature during rainfall and subsequent thereto is important; increasing temperature accelerates and decreasing temperature retards emergence; appearance in the field is closely associated with emergence from the hibernation cages, and emergence can be correlated with rainfall; the peak of the overwintered-beetle infestation in the field is subsequent to the peak of emergence from the hibernation cages."

Weights of wireworm larvae.--Continuing his studies on the weights of growing larvae, C. E. Woodworth, Walla Walla, Wash., has found that "in two months time an extreme variability of about 120 times has been developed (.2 mg. to 23.8 mg.) in young wireworm larvae, the largest individual having developed about 300 times its original size, while the smallest one is hardly 3 times. * * * Under identical conditions there is a range of from 1.6 to 8.5 times in the size of the smallest and the largest. This would indicate that there would be very grave doubt in estimating the age of an individual by size. * * * It also seems that 72.5° F. again is indicated as the optimum temperature for development as there are the smallest variations from the mean experienced under both of the conditions examined."

Soil temperatures for wireworms.--E. W. Jones, Walla Walla, reports that "In connection with investigations on low temperature as a factor in the ecology of wireworms, a study of winter soil temperatures and their relation to soil insect survival was completed this month (March). Three field conditions were studied. * * * alfalfa-covered ground with snow; bare ground with snow cover; and bare ground without snow cover. * * * The soil temperatures in the alfalfa-covered field with snow were the highest and most constant of all these fields. Temperatures in the alfalfa never went below 32° F. The field of bare ground with snow cover was intermediate between the alfalfa field and bare ground without snow. The temperatures of this field never went below 30.2° F., however. The extreme low soil temperatures occurred on bare ground without snow. * * * Under normal conditions soil temperatures do not get low enough to kill hibernating wireworms. The hibernation depths for the majority of the worms are from 6 to 12 inches. Soil temperatures of bare ground are not likely to go below 30.2° F. at 6 inches. Such temperatures would hardly affect wireworms which have average undercooling points and freezing points of 15.8° F. and 19.4° F., respectively."

Seed-corn maggot in potatoes.--W. J. Reid, jr., Charleston, S. C., reports that "During March," he "kept under close observation the two potato demonstration plots planted in Charleston County in cooperation with local growers and the County Agricultural Agent. * * * The soil during the winter has been too dry for organic matter to decompose so that it would prove suitable as food for the seed-corn maggot. Consequently there has been a very small population of the seed-corn maggot, in the soil this spring and little injury to potatoes." The infestation of seed freshly cut when planted was 12 per cent, while in seed suberized in advance of planting it was zero.

FOREST INSECTS

Tachina larvarum L. and T. mella Wlk. specifically distinct.--Ray T. Webber, of the gipsy moth laboratory, Melrose Highlands, Mass., has continued his studies of these species and states that the "results of this study confirm tentative statements made in previous reports to the effect that the species are distinct and can be identified as such in at least two stages of their life."

"Wilt" important factor in gipsy moth control.--R. C. Brown, Melrose Highlands, submits the following report on "wilt": "Observations have been made on this important polyhedral disease of Porthetria dispar L. larvae and pupae since the 'observation point' project was started in 1912. From 1915 to date collections of larvae have been made each year at points which represent fairly well the older infested area and an accurate record of those larvae which have died of the 'wilt' disease has been kept. An examination of these records shows that there were two years when the mortality caused by 'wilt' was distinctly higher than in other years throughout this period. In 1920 a mortality

of 69.3 per cent occurred in the larval collections and in 1921 it reached the high figure of 86.1 per cent. Previous to and after those years the mortality fluctuated between 27 per cent and 55 per cent but there were no outstanding years. There appears to be a close correlation between the abnormally high larval mortality caused by 'wilt' and the reduction in the gipsy moth population in New England. The last year of extremely heavy infestation, 1921, was the critical year in the gipsy moth infestation in New England. In 1922, 1923, and 1924 a great decrease in the dispar infestation occurred. Since that time the infestation has never even approached the intensity of 1921. It would therefore appear that one would be justified in concluding that 'wilt' was a very important factor in checking the ravages of P. dispar in New England."

Mortality and parasitism of brown-tail moth.—"The examination of larvae from hibernation webs, collected in 29 towns in Maine, New Hampshire, and Massachusetts, to secure information on mortality and parasitism (of the brown-tail moth(Nygmia phaeorrhoea Don.)) has been completed by J. A. Millar, J. E. R. Holbrook, and C. M. Symonds. Mr. Millar reports that 15.6 per cent of the larvae found in 268 webs were dead. Of the larvae dissected 28.3 per cent were parasitized. Examination of material from practically the same towns a year ago showed 11.4 per cent of the larvae dead, and 25.5 per cent of the larvae dissected were parasitized." These collections were "made before the time of the lowest winter temperatures."

Bordeaux mixture beneficial addition to arsenicals.—S. F. Potts, Melrose Highlands, in a manuscript just prepared for publication, says he found that "when Bordeaux mixture was added to lead arsenate, Paris green, and calcium arsenate (respectively) the solubility of the arsenicals was much reduced and their adherence greatly increased, the increase being several fold in the case of Paris green and calcium arsenate."

Burning-standing method controls Dendroctonus monticolae Hopk.—J. C. Evenden, Coeur d'Alene, Idaho, reports that "During the past season an investigation (under the field supervision of L. G. Baumhofer and T. T. Terrell) was concluded relative to the effectiveness of the burning-standing method of control as practiced against outbreaks of the mountain pine beetle in lodgepole pine. This method consists of spraying an inflammable oil upon standing infested trees and then burning. The purpose of this investigation was to determine what per cent of the brood was left in the upper portion of the tree which could not be reached with the oil. * * * The results of this investigation show that in the area examined the straight burning-standing method of control destroys approximately 90 per cent of the insect broods, even though a larger per cent of the infested bole is left untreated. This is explained by the fact that the insect broods are much lighter in the upper portion of the bole than at its base."